DOCUMENT RESUME

ED 396 722 IR 017 935

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TITLE PC Based Video on Demand Trials.
PUB DATE 96
NOTE 5p.; In: Learning Technologies: Prospects and Pathways. Selected papers from EdTech '96 Biennial Conference of the Australian Society for Educational Technology (Melbourne, Australia, July 7-10, 1996); see IR 017 931.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Academic Libraries; *Computer Assisted Instruction; Computer Networks; *Computer System Design; Costs; Digital Computers; Educational Technology; Foreign Countries; Higher Education; *Instructional Material Evaluation; Microcomputers
IDENTIFIERS Access to Services; Digital Technology; *Digital Video Interactive; Limits to Growth; *Monash University (Australia); Video Technology; Video Viewing

ABSTRACT

Many educational institutions have a substantial personal computer (PC) network that can be adapted to provide digital video on demand, as well as PCs that can be used as video on demand clients. To gain insight into the issues involved in using this technology in an educational environment that relies heavily on video, a simple, low cost video on demand system was installed in the Visual Arts Library at Monash University, Clayton (Australia). Qualitative trials were then carried out involving staff and students from the film and television studies section of the Visual Arts Department. Each user was asked to view the encoded materials, experiment with the technology, and critically evaluate the video excerpts. The video on demand system was identified as being of most benefit to students in individual study of course material. The system allows one digitally encoded video to be used concurrently by many people, solving the problem of limited viewing facilities. The flexibility of digital video also enables new ways of presenting comparative materials as well as providing more efficient ways to undertake typical student assignments. For example, it facilitates repetitions of a single scene for in-depth analysis. The issues identified as the most problematic in the use of the technology in the teaching of film studies are cost, quality, and speed of encoding the material from VCR to MPEG. Overall, the reaction from participants in the trials was positive. (Author/AEF)

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PC Based Video on Demand Trials

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ED 396 722

IR017935

This paper describes video on demand trials conducted within the Department of Visual Arts at Monash University. A prototype video on demand system was used to gain some understanding of the issues involved in the use of this technology in teaching. Qualitative trials were conducted with teaching and library staff as well as students. Although this technology has great potential, there are a number of issues that need to be resolved before it could be used widely in education. These issues are discussed and trials planned for this year are outlined.

1. Introduction

Until recently, video on demand systems were only available as massive, expensive, Pay TV video servers, able to store hundreds of hours of digitally encoded video and support thousands of users. In the last two years however, smaller, low cost video on demand systems able to screen video have become available. These systems store video in digital form in the same way as other digital material, such as text, still images and sound. They deliver video over existing data networks to suitably equipped PC's. They are designed to use existing infrastructure as much as possible.

Since PC based video server technology has only recently become available, it is not widely deployed. There is however tremendous scope for its use in education. Digital video has many advantages over VCR and other analog systems. Only one copy of a sequence is stored, yet multiple users are able to scan different parts of it. The material does not wear out with use and does not lose quality with age, nor does the signal deteriorate as the distance between the source and the client increases. Many education institutions have a substantial personal computer network that can be adapted to provide digital video on demand, as well as PC's that can be used as video on demand clients. The technology is reasonably affordable, flexible and is likely to be adopted widely in the next few years.

To gain some insight into the issues involved in using this technology in an educational environment that relies heavily on video, a simple, low cost, video on demand system was installed in the Visual Arts Library at Monash University, Clayton. Qualitative trials involving staff and students from the film and television studies section of the Visual Arts Department were then carried out. The aims of these trials were:

To gauge the acceptability, advantages and disadvantages of the Video on Demand system and Video on Demand in general,

To make qualitative comparisons with current ways of delivering video, and most importantly,

To identify the barriers to the successful deployment of this technology in a teaching and research environment.

The study of film and television within the Department of Visual Arts is undertaken from first-to-third-year at undergraduate level and also at Graduate Diploma, Masters and PhD levels. Courses are predominantly critical, historical and theoretical. Methodologies derived from semiotics,

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psychoanalysis, structuralism, poststructuralism, feminism and cultural studies may be used to analyse a range of issues such as the evolution of film form, film as a vehicle of ideology, and the construction of sexual difference through film. These courses consistently attract high student numbers. Analog videotape is used heavily as a teaching resource — for full length screenings as well as lectures and seminars. Students also use videos as a resource for assignments and independent study.

2. System Description

The system was installed in the Visual Arts Library under the supervision of the Librarian. Starlight Video Server software able to support up to 10 Microsoft Windows based PC clients was used. The video server provides true video on demand. Multiple clients are able to view, pause and reposition the same video sequence concurrently. The server software runs on a 486 EISA bus PC, equipped with multiple SCSI disks. Whilst the prototype system was only able to store two hours of digitally encoded material, a fully equipped system can store much more.

The video material was encoded from VCR copies at 1.25Mbit/s using the MPEG encoding standard and equipment developed at Monash University. MPEG encoding provides very high quality full screen video and audio at comparatively low bit rates, but is quite complex. This complexity makes encoding expensive when compared with other techniques and requires the use of additional hardware to be installed in the PC to decode the video stream. These MPEG decoder cards typically cost about $400.

The client software uses a standard Microsoft Windows interface to access the server of digitally encoded video material. Delivery of the material is over a standard Ethernet network.

3. Trials

3.1 Participants and Procedures

The video on demand system was demonstrated to all groups currently involved with the handling and use of analog video for film studies:

- academic staff ranging from senior lecturer to assistant lecturer;
- librarians and library staff from Visual Arts Library and the Main Library; and
- graduate and undergraduate students.

Each user was asked to critically evaluate the video excerpts using a range of criteria(such as quality, window size, user interface, psychological factors) and to make comments. The trial periods, which lasted up to one hour, consisted of participants viewing the encoded materials and experimenting with the technology themselves. A number of useful observations arose from the discussions which followed the demonstrations.

Materials used in trials

Material for encoding was selected from the Department's teaching program. Approximately 90 minutes of material -excerpts from three television programs and two films — was encoded. A mixture of film and animation was used. All encoding was done through Siemens' Eikona system, developed at Monash University.

4. Observations by Participants

4.1 Potential Use in Research and Teaching of Film Studies

The components of film studies teaching are the full length screening, the lecture and seminar which may include video excerpts, and student re-viewing of the films for seminar preparation, assignments and visual tests.

The video on demand system was identified as being of most benefit to students in individual study of course material. Digital video offers distinct advantages in terms of access and use.

Currently there are limited facilities provided by the University main library for student viewing of videos. (No facilities are available for students within the Department of Visual Arts or the Visual Arts Library). In addition, the University main library generally holds only one copy of each video title, hence there is considerable reliance on students being able to obtain material from commercial

libraries and watch it on players at home. To a certain extent, this restricts the material that can be used in courses and adds a financial burden to students who cannot access the material on campus due to high demand.

Video on demand has the potential to solve some of these problems of access. One digitally encoded video can be used concurrently by many users. Assuming sufficient PC clients were available, the demand for access could be met more effectively. The amount of time library staff spend processing video loans and monitoring their use would be reduced and the problem of theft or damage eliminated as the material is stored centrally on the server.

The flexibility of digital video enables new ways of presenting comparative materials as well as providing more efficient ways to undertake typical student assignments such as the preparation of a shot table. To carry out a detailed analysis, a student may need to view the same excerpt up to 20 times. Video on demand would allow multiple users to work on the same scene over and over again. With videotape this type of use results very quickly in visible physical damage and the need for costly replacement. There is no equivalent deterioration with digital video. The video on demand system also allows users to run a word-processing software concurrently on screen with the video offering a unique way of taking notes about a film.

The usefulness of video on demand for lecturing purposes is less clear and requires further investigation. Film research requires access to such a broad range if visual materials which effectively puts it beyond the scope of institutional video on demand system.

4.2 Encoding Issues

The issues identified as the most problematic in the use of the technology in the teaching of film studies are cost, quality and speed of encoding the material from VCR to MPEG.

The number of film and television undergraduate courses offered in any one year by the Department of Visual Arts is around eight. One feature length film or equivalent would be screened each week in each of these courses. The encoding costs and storage requirements for such a large volume of material would be beyond the means of the average University department's budget. It was generally agreed that, at this stage, video on demand was not a viable or even desirable alternative to videotape or laserdisk for screenings.

Lecture and seminar preparation may involve staff screening a mass of material in order to make general comments about it (but not necessarily screening it) during the lecture and/or browsing a wide variety of materials to select excerpts to` illustrate particular points they might wish to make. The content of some courses differs markedly from year to year, especially those dealing with television or contemporary film, hence it is not possible to isolate a body of regularly used material that can be encoded once and guaranteed to be useful for teaching thereafter. Again the cost of encoding and the storage needed for such a large volume of material are major deterrents.

Decisions about what is to be screened can not always be made sufficiently well in advance to allow time for encoding of the appropriate excerpts. The speed and ease of encoding is therefore a major consideration. While some form of quick (if not realtime) encoding from VCR to MPEG may be seen to be essential, the quality of this encoding can be quite low.

The quality of encoded video images was a concern for many of the participants of the trials. The material currently used in teaching and research varies in quality enormously (from home videos through to high quality commercially released videos and laserdisks). In comparison with the average standard of analog materials, the digital video was of acceptable quality, however it did not compare well to high quality videotape or laserdisk. The opinion was that some improvements in the quality of encoding was essential.

There was some disagreement amongst participants as to whether the quality of the material was suitable for lectures. Overall it was felt to be adequate only for student viewing. Since the material used in the trials was encoded from a VCR recorded from television broadcasts , this is not surprising. There was some concern over MPEG encoding artefacts, which seemed worse in animation material with its limited number of colours and hard lines than in images with natural colour. Other MPEG artefacts which were noticeable and distracting to viewers included blockiness and 'tearing' along the bottom of the image and jerkiness. Whether there are encoding or network artefacts needs to be determined through further investigation. The quality issue is one suitable for investigation in further trials.

One issue which was not considered during the trials was copyright. The legalities of encoding video to be used for teaching as opposed to research are unclear as are the implications for a video on demand system. Are royalties paid based on the number of users who might be accessing the material at any one time, or are they paid for the single copy held in the database? Is there a difference between individuals accessing the video independently and the video being shown in a class?

4.3 PC Issues

Several issues were raised in relation to the effects of watching video on a PC rather than a screen.

The first was the Windows interface. Even for experienced PC users, the interface appeared simple but was actually confusing and difficult to use. For general student use, the interface needs to be made fool proof. The Windows bar on the screen was seen to be a distraction and users suggested there be a way of removing it. More control was also required over the sizing of the video window. Other desirable features for the client software were colour adjustment, ability to extract stills from a sequence and running of multiple sequences concurrently.

For viewing film, the ideal scenario is one where the near-darkness of a cinema minimises distractions and allows the viewer to be dominated by over-life size images and sound. Watching a film or a computer screen clearly does not have the same impact or psychological effect as the viewer is always conscious of the medium instead of being immersed in it. For some trial participants this was not necessarily a disadvantage as they felt it encouraged close analysis of film form because one was so conscious of it. Others however expressed reservations about this way of viewing film. There was the perception that being so close to the screen exaggerated camera movement and that colours available through the PC were somewhat lifeless compared with analog video.

4.4. Other Issues

Occasionally in some courses, materials are screened which may be described as controversial. For obvious reasons, some form of security such as password or student number might be needed to restrict viewing of videos to students enrolled in the course.

Digital still images have been used by art historians in the Department of Visual Arts since 1994. The demand for increased image quality has grown rapidly with familiarity and with access to high quality display devices. A similar response to digital video images from the Department's film scholars could be expected once the novelty of the computer screen wears off. Given the demand for higher quality can be anticipated, it might be desirable to encode as a high rate to create an archive file, and then derive a medium to low resolution working image for use in the short term.

5. Conclusion and Further Trials

Overall the reaction from participants in the trials has been positive and some role for this technology in film studies teaching is clearly envisaged, the most likely use being student purposes. The use of the technology for lectures is tied to the issue of video quality and access to a large volume of material. Quality could be the subject of further trials. The single biggest barrier identified so far is the speed and cost of encoding. Further trials are planned for 1996. These involve installing video clients at Caulfield and Clayton Campus libraries and providing video on demand from a large capacity server located at Clayton. Issues for investigation include implementation and useability. It is anticipated that the trials will be extended to include other interested groups in the University.

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